

Dual-circuit power brake valve with compact design

LT 13

RE 66221

Edition: 05.2017

Replaces: 04.2014



LT 13 H

- ▶ Compact module with brake valve and accumulator charging valve, optionally with parking brake
- ▶ Nominal pressure 40, 60, 80, 100 and 125 bar
- ▶ Maximum parking brake pressure 210 bar
- ▶ Series 3X

Features

- ▶ Electric or mechanical parking brake valve (optional)
- ▶ Brake pressure proportional to actuating force and actuation path
- ▶ Quick and easy installation
- ▶ Minimized piping work
- ▶ Little space required
- ▶ Integration into existing hydraulic systems possible
- ▶ Fast operational readiness
- ▶ Sensitive metering
- ▶ Minimum number of components
- ▶ Flexible installation

Fields of application

- ▶ Construction machinery
- ▶ Material handling vehicles
- ▶ Forestry and agricultural machinery
- ▶ Municipal vehicles
- ▶ Specialized vehicles

Contents

Type code	2
Functional description	4
Technical data	6
Characteristic curves	7
Types of actuation	8
Overall set-up	9
Dimensions	12
Line connections	17
Brake pedal models	18
Accessories	19
Related documentation	20

Type code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
LT 13		3X	/							/		M		*

Series

01	Dual-circuit power brake valve with compact design LT 13	LT 13
----	--	-------

Type of actuation service brake (BBA)

02	Mechanical	M
	Hydraulic, series connection	H
	Hydraulic, parallel connection	P
	Mechanical/hydraulic combined	K

Series

03	30 to 39 (unchanged installation and connection dimensions)	3X
----	---	----

Characteristic curve

04	Linear characteristic curve	L
	Progressive characteristic curve	P

Nominal pressure (service brake pressure BBA)

05	40 bar	040
	60 bar	060
	80 bar	080
	100 bar	100
	125 bar	125

Type of actuation parking brake (FBA)

06	Without FBA	-
	Mechanically operated	M
	Electrically switched ¹⁾	E
	Electrically switched, reduced	R
	Electrically switched with external pressure supply ²⁾	S

Parking brake pressure (FBA)

07	^{1); 2)}	XXX
	Without FBA	000
	20 bar	020
	40 bar	040
	60 bar	060
	80 bar	080
	100 bar	100
	120 bar	120

Accumulator charging pressure

08	100 bar	A
	120 bar	B
	150 bar (standard)	C
	165 bar	D
	185 bar	E
	200 bar	F

¹⁾ With the electrically switched FBA, the parking brake pressure of the FBA corresponds to the accumulator charging pressure. Observe the switching hysteresis!

²⁾ With external FBA pressure supply, the parking brake pressure of the FBA corresponds to the supplied pressure.

01	02	03		04	05	06	07	08	09	10	11		12	13	14	15
LT 13		3X	/									/		M		*

Accumulator charging flow

09	Approx. 17 l/min (standard)	B40
	Approx. 6 l/min	B18

Voltage at the switching solenoid

10	12 Volt	AG12
	24 Volt	AG24

Connector type (standard with manual override)³⁾

11	Cubic connector	NK4
	Deutsch connector	NK40
	Junior timer, 2-pin (AMP)	NC4

Line connections

12	ISO metric thread according to DIN 3852-1	02
	UNF thread according to ISO 11926-1	19

Sealing material

13	NBR (nitrile rubber)	M
----	----------------------	----------

Additional equipment

14	With pressure switch (not possible in conjunction with parking brake version R)	14
	With actuation rod	16
	With actuation rod and pressure switch (not possible in conjunction with parking brake version R)	17

15	Further specifications in plain text	*
----	--------------------------------------	----------

³⁾ Plug-in connectors are not included in the scope of delivery and must be ordered separately, see data sheet 08006.

Functional description

The LT 13 is a dual-circuit power brake valve with compact design, which combines all the required functions in one valve.

Accumulator charging valve

The accumulator charging valve **(1)** primarily charges the accumulator. If the accumulator pressure falls below the switch-on pressure of the charging valve, the accumulators will be charged until the cut-off pressure is reached. The switching pressure differential is approx. 18% of the cut-off pressure. The accumulators are charged with a charging flow of e.g., 17 l/min (version B40). If the pump conveys more than e.g., 17 l/min, then the downstream consumer **(N)** is supplied with the difference.

Notice

If downstream consumers **(N)** generate a pressure higher than the cut-off pressure of the accumulator charging valve, then the accumulator circuit is raised to this pressure level. The pressure of the downstream consumers **(N)** must be 30% lower than the set accumulator charging pressure ($N < \text{accumulator charging pressure} - 30\%$).

Circuit separation

The valve supplies two separate brake circuits. They are separated by means of an inverted shuttle valve **(2)**.

Dual-circuit brake valve

The dual-circuit power brake valve LT 13 is a directly operated pressure reducing valve in a 3-way version with continuous mechanical actuation. The LT 13 essentially consists of two 3-way pressure reducing valves arranged in tandem design. The pressure in both brake circuits increases proportional to the actuating force and actuation path. When the deflection is kept constant, the regulated pressure in the channels **BR1** and **BR2** is kept constant. The valve of the first brake circuit **(4.1)** is directly operated. The pressure of the second brake circuit **(4.2)** is controlled by the first brake valve. If the hydraulic supply of the first brake circuit fails, the second brake circuit will then be directly operated.

Mechanically operated service brake

For the mechanical actuation of the LT 13 M, an LT 20 foot pedal is suitable (for variants see page 18). When the recommended overall set-up is observed, the actuating force and actuation path are matched to one another.

Hydraulically operated service brake

For hydraulic actuation, the tandem master cylinder is actuated using a suitable pedal. The hydraulic fluid supplied from the storage tank is piped to the LT 13 H pickup head proportional to the pedal path. Both the tandem master cylinder and the LT 13 H pickup head have two separate chambers.

Proportional to the supplied hydraulic fluid, the pickup spools move in line and charge the main brake spools via the brake pressure control springs.

Mechanically operated parking brake/auxiliary brake (3)

The parking brake valve is a directly operated 3-way pressure reducing valve. If the valve is actuated, the pressure then drops proportional to the actuation. The valve controls the pressure by means of metering. As a result, the “auxiliary brake” function can also be fulfilled.

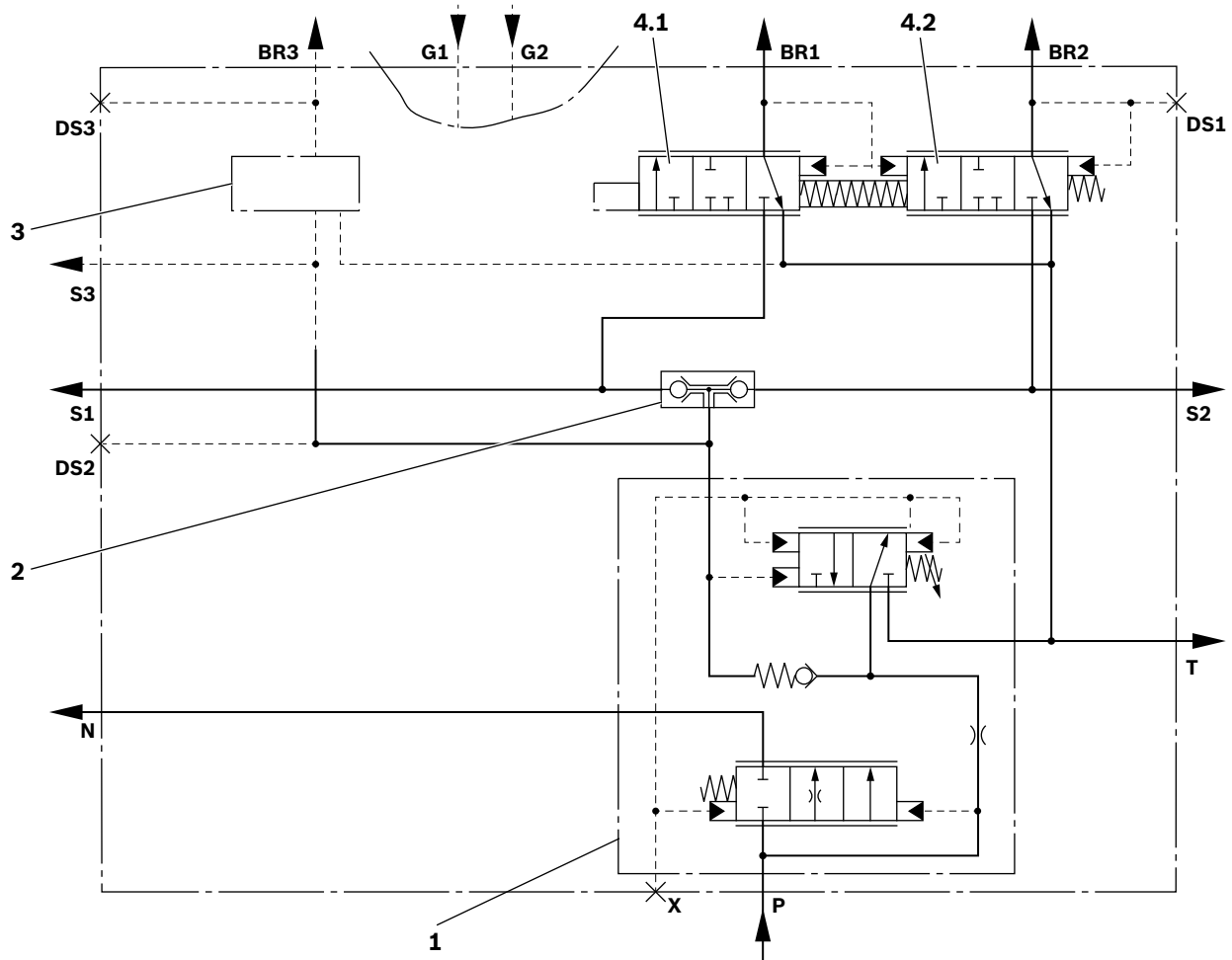
Electrically switched parking brake (3)

The electrically switched parking brake valve **(3)** is a 3/2 directional valve. If the valve is switched with an electric signal, then port **BR3** is connected to port **S3**. The applied accumulator pressure **S3** supplies the parking brake via **BR3**. When the electric signal is switched off or fails, the parking brake valve **BR3** connects to **T** and the applied pressure in the parking brake can be reduced. The auxiliary brake function cannot be realized.

Mechanical/hydraulic combined, actuated service brake

For the mechanical actuation of the LT 13 K, an LT 20 foot pedal is suitable (for variants see page 18). When the recommended overall set-up is observed, the actuating force and actuation path are matched to one another. The LT 13 K can also be hydraulically controlled via port **G**. This control is either carried out via the internal parking brake valve **(3)** or via an external pressure supply (switchable or proportional).

▼ Symbol LT 13



- 1 Accumulator charging valve
- 2 Shuttle valve
- 3 Parking brake (optional) (FBA)
- 4 Dual-circuit brake valve (BBA)

Ports	
BR1	Service brake (1st brake circuit)
BR2	Service brake (2nd brake circuit)
BR3	Parking brake
DS1	Pressure switch brake lights
DS2	Pressure switch accumulator pressure
DS3	Pressure switch parking brake
S1	Supply to service brake (1st brake circuit)
S2	Supply to service brake circuit (2nd brake circuit)
S3	Supply to parking brake
G	Hydraulic control of the service brake (alternative)
P	Pump
T	Reservoir
N	Return flow or downstream consumers
X	Load sensing (LS)

Technical data

General					
Weight (approx.)		kg		11 (depends on the version)	
Installation position				Preferably horizontal	
Connection type				Metric thread	
Ambient temperature range		θ	°C	-25 to +80	
Standard paint				One-coat paint RAL 5010	
Hydraulic					
		Port			
Nominal pressure		BR1, BR2	p_{Br}	bar	40 ... 125
Maximum inlet pressure		P	p	bar	210
Maximum pilot pressure	Version H	G1, G2	p_G	bar	40
	Version P	G1, G3	p_G	bar	180
	Version K	G	p_G	bar	180
Maximum reservoir pressure		T	p	bar	0.5 (the reservoir pressure must not exceed the application pressure of the brake.)
Maximum parking brake pressure	Version M	BR3	p	bar	120
	Version E	BR3	p	bar	Corresponds to the accumulator charging pressure
	Version R	BR3	p	bar	120
	Version S	BR3	p	bar	210 (Δ max. pressure S3 of the external pressure supply)
Maximum accumulator charging pressure	Cut-off pressure	S1, S2, S3	p	bar	210
	Switch-on pressure	S1, S2, S3	p	bar	Approx. 18% lower than the set accumulator charging pressure
Maximum consumer pressure		N	p	bar	30% lower than the set accumulator charging pressure
Maximum flow		P → S		l/min	approx. 6 (B18) approx. 17 (standard, B40)
		P → N		l/min	70
Hydraulic fluid					Mineral oil (HL, HLP) according to DIN 51524, other hydraulic fluids, e.g. HEES (Synthetic ester) according to ISO 15380 and hydraulic fluids as specified in data sheet 90221, on request
Hydraulic fluid temperature range		θ	°C		-20 to +80
Viscosity range		ν	mm ² /s		2.8 to 380
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness level as per ISO 4406 (c)					Class 20/18/15, we recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$
Electric					
Voltage type					DC voltage
Supply voltage			V		12; 24
Type of protection according to VDE 0470-1 (DIN EN 60529), DIN 40050-9	Version K4				IP65 with installed and locked plug-in connector ¹⁾
	Version C4				IP65 with installed and locked plug-in connector ¹⁾
					IP69K with Rexroth plug-in connector (material number R901022127) ¹⁾
	Version K40				IP65K with installed and locked plug-in connector ¹⁾

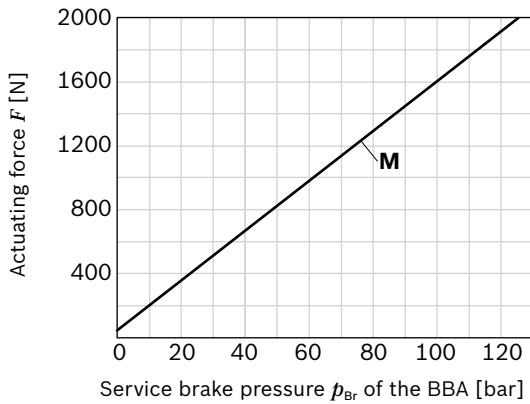
Notice

Please contact us if the unit is to be used outside the specified range of values.

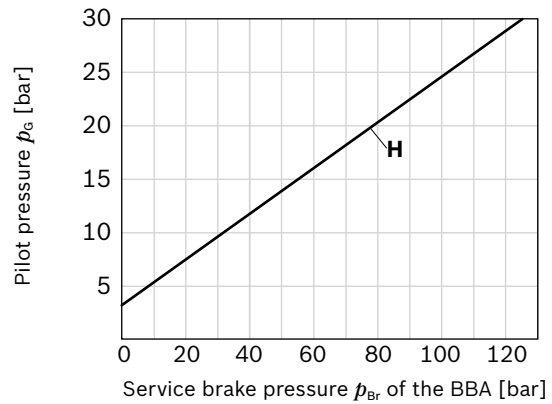
¹⁾ Plug-in connectors are not included in the scope of delivery and must be ordered separately, see data sheet 08006.

Characteristic curves

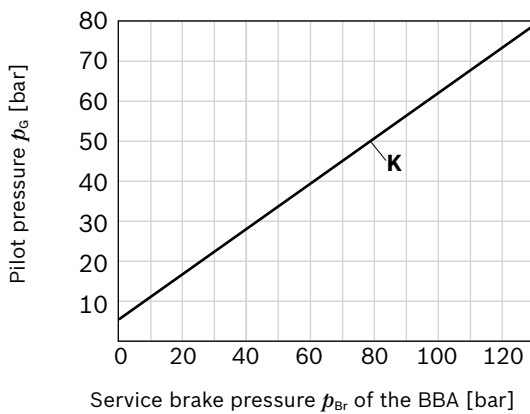
▼ Type of actuation mechanical, linear characteristic curves (directly operated, without pedal)



▼ Type of actuation hydraulic, linear characteristic curves



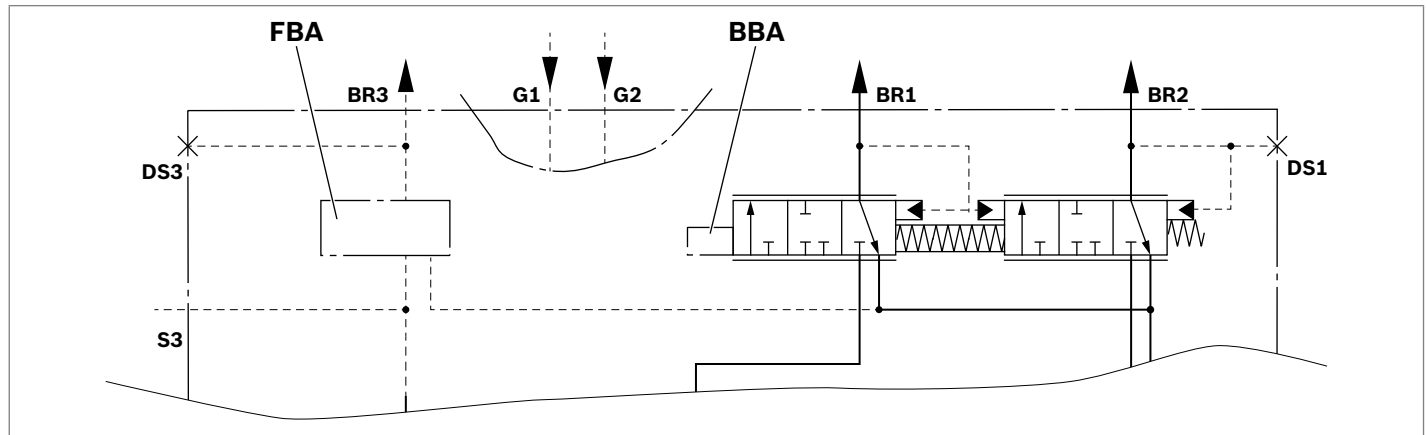
▼ Type of actuation mechanical/hydraulic combined, linear characteristic curves



Notice

The set service brake pressure cannot be exceeded with a higher pilot pressure.

Types of actuation



Parking brake (FBA)	Service brake (BBA)
M 	M
E 	H¹⁾
S 	P¹⁾
R 	K¹⁾

¹⁾ The connection to port **G** needs to be made by the customer.
Bosch Rexroth recommends an upstream damping valve at port **G**
for directly switched actuation.

Overall set-up

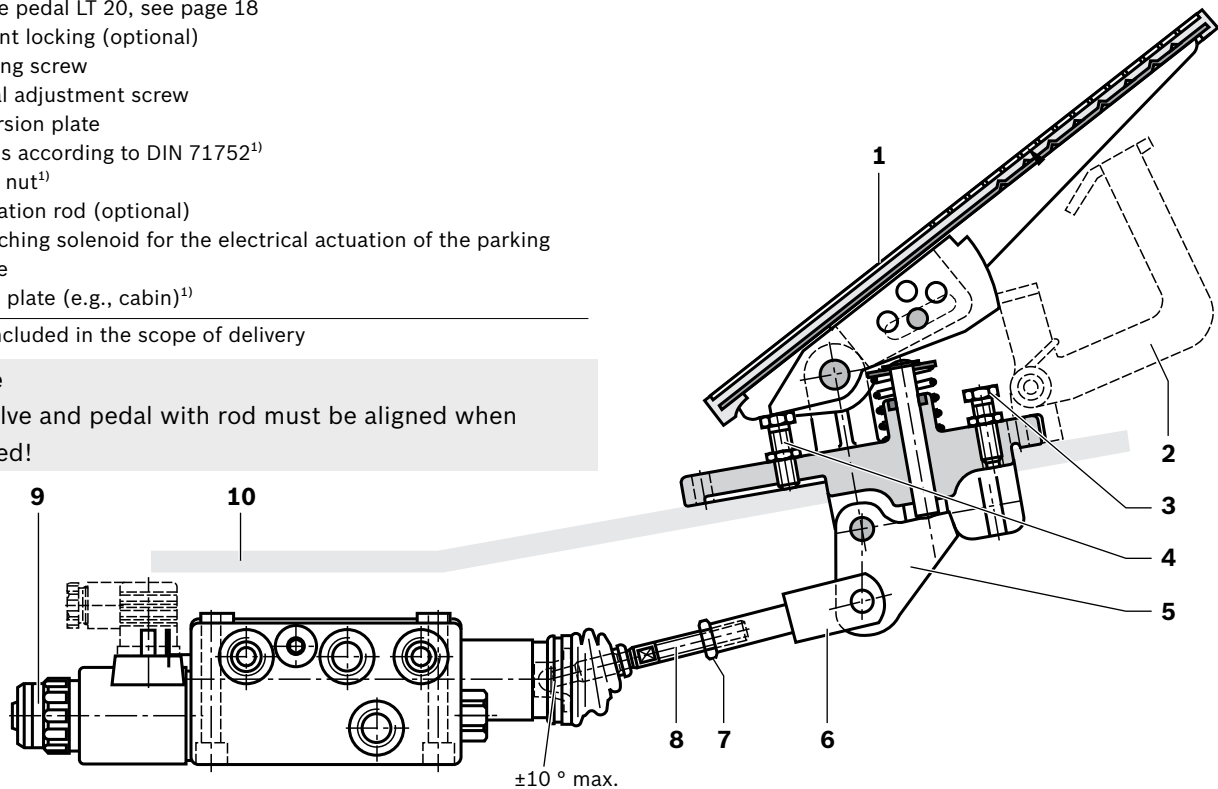
LT 13 with mechanical actuation BBA

- 1 Brake pedal LT 20, see page 18
- 2 Detent locking (optional)
- 3 Setting screw
- 4 Pedal adjustment screw
- 5 Diversion plate
- 6 Clevis according to DIN 71752¹⁾
- 7 Lock nut¹⁾
- 8 Actuation rod (optional)
- 9 Switching solenoid for the electrical actuation of the parking brake
- 10 Base plate (e.g., cabin)¹⁾

¹⁾ Not included in the scope of delivery

Notice

The valve and pedal with rod must be aligned when installed!



Installation

For low-friction actuation, it is important that the valve that is well aligned with the pedal. In the plan view, the valve axis, actuation rod (8) and pedal (1) must be aligned! In the side view, the actuation rod may press against the valve actuation at a maximum angle of 10°. The gradient and height of the pedal influence the actuation angle and the force.

If the required space necessitates a control with a longer actuation unit, it has to be resistant to buckling (see actuating force).

Setting the pedal

The lock nut (7) and clevis (6) are screwed onto the actuation rod (8), after installing the valve and the pedal, the clevis (6) is connected to the diversion plate (5) with the axle bolt.

Pedal (1) not actuated

The actuation rod (8) is adjusted until the play between the ball end and valve actuation is reduced to a minimum.

Notice

The valve actuation must not be preloaded. The actuation rod must be able to move very slightly back and forth. This setting is secured by means of the lock nut (7).

Pedal (1) actuated

The maximum brake pressure is set as required using the setting screw (3) and secured by means of the lock nut. When the pedal is released, only the reservoir pressure may be available.

Option – Pedal with detent locking (2)

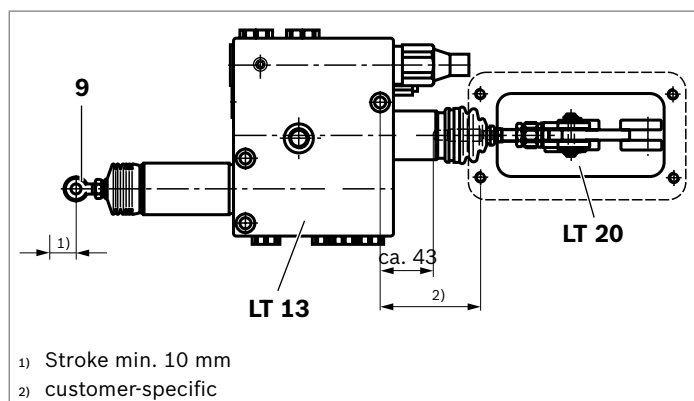
The lock nut (7) and clevis (6) are screwed onto the actuation rod (8), the clevis is connected to the diversion plate (5) with the axle bolt. Bring the pedal in the detented position. Set the actuation rod (8) so that the valve achieves the desired maximum pressure. The pressure setting can be secured by locking the nut (7).

Releasing the detent locking

When the pedal (1) is not actuated, rotate the pedal adjustment screw (4) until the smallest possible play is achieved.

Parking brake version M

The parking brake is set to the desired pressure at the factory. If the parking brake is not activated, the parking brake pressure corresponds to the pressure set at the factory. The Bowden cable must be set so that no traction force acts on the eye bolt (9) in the non-actuated state. With increasing actuation (pulling) of the parking brake, the brake pressure decreases to the reservoir pressure. The entire force of the spring-loaded accumulator cylinder then acts on the wheel brake. To this end, the Bowden cable must allow for a stroke of at least 10 mm. The holding force corresponds to the connection force and is max. 1100 N. The Bowden cable should be laid in such a way that low-friction actuation is possible.



Parking brake version E

The electric FBA cannot be set.

When voltage is applied to the solenoid (12 or 24 Volt), the accumulator pressure is switched to the parking brake. The minimum parking brake pressure corresponds to the switch-on pressure of the charging valve. If no voltage is applied to the solenoid, the output pressure corresponds to the reservoir pressure.

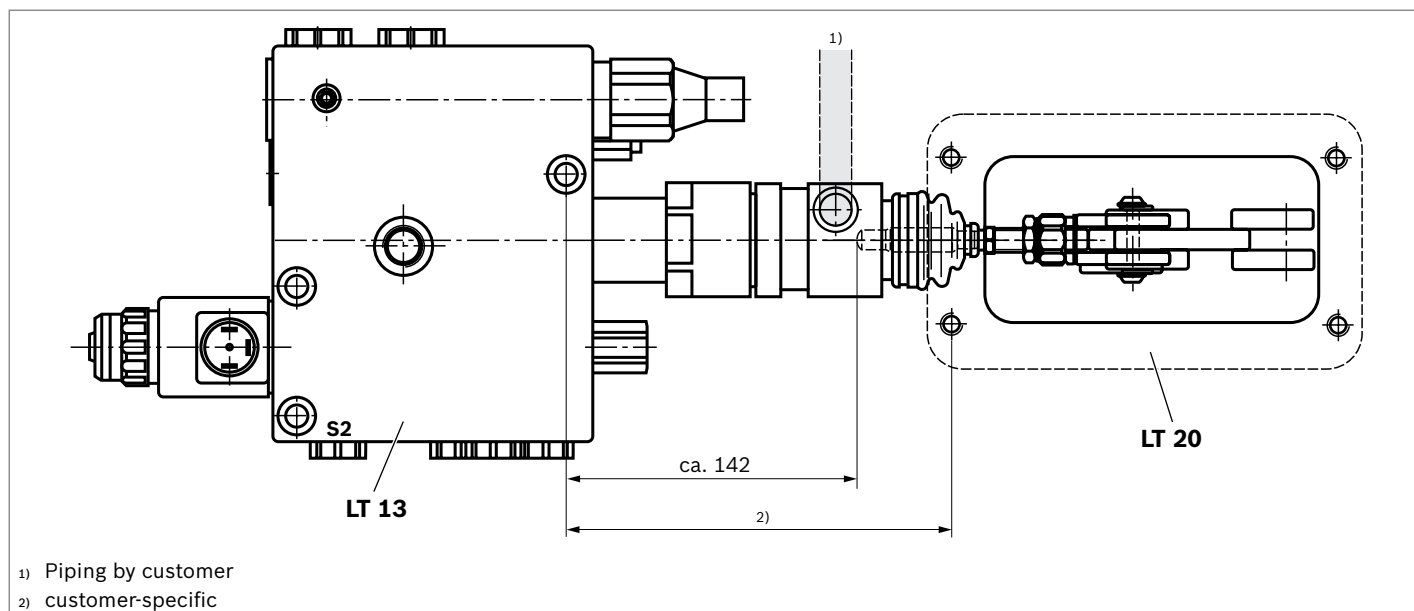
Parking brake version R

When voltage is applied to the solenoid (12 or 24 Volt), the set pressure is switched to the parking brake. If no voltage is applied to the solenoid, the output pressure corresponds to the reservoir pressure.

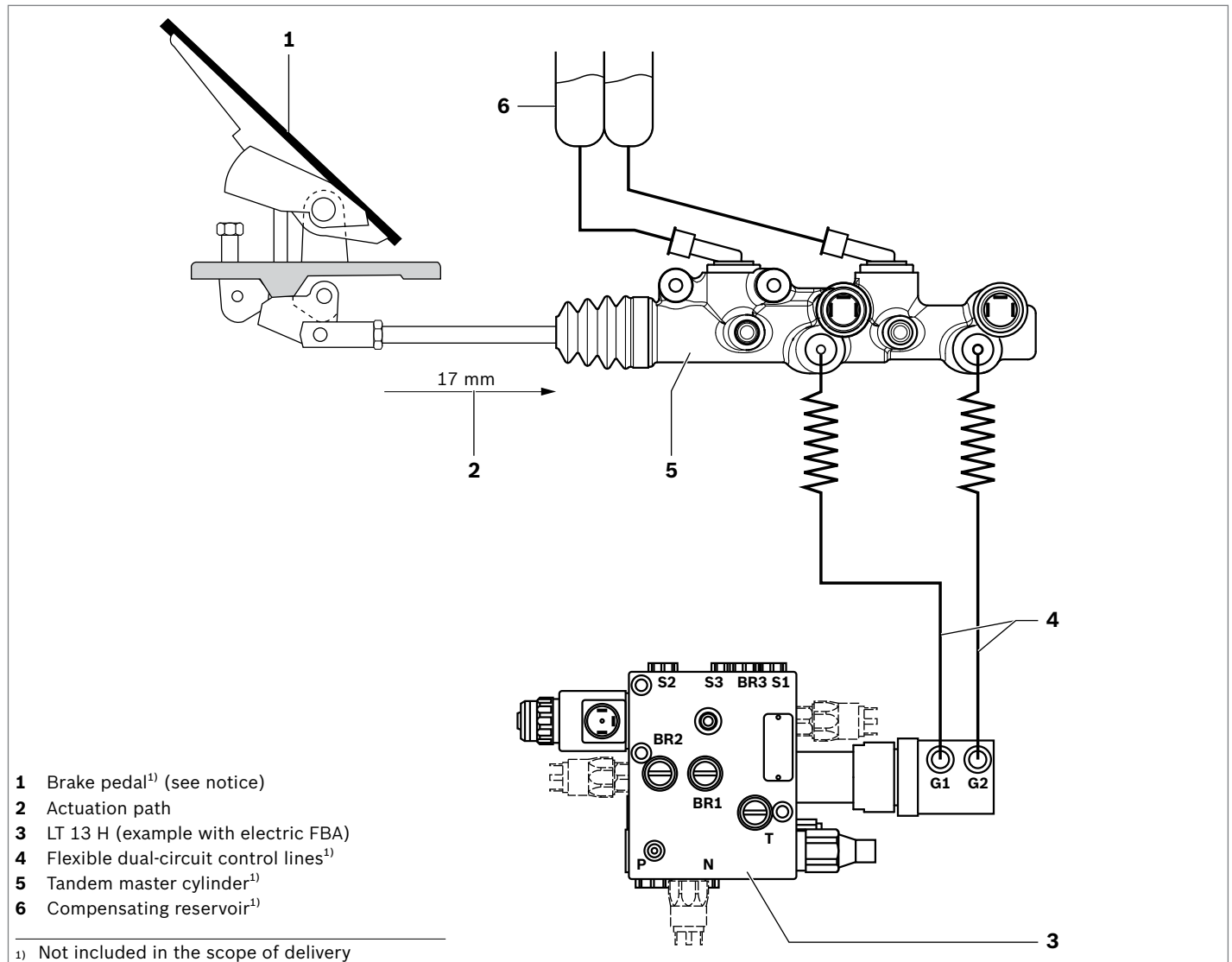
Parking brake version S

When voltage is applied to the solenoid (12 or 24 Volt), the external pressure supply connected to **S3** is connected to port **BR3** and switched to the parking brake. If no voltage is applied to the solenoid, the output pressure **BR3** corresponds to the reservoir pressure.

LT 13 With combined mechanical/hydraulic actuation BBA



LT 13 with hydraulic actuation BBA



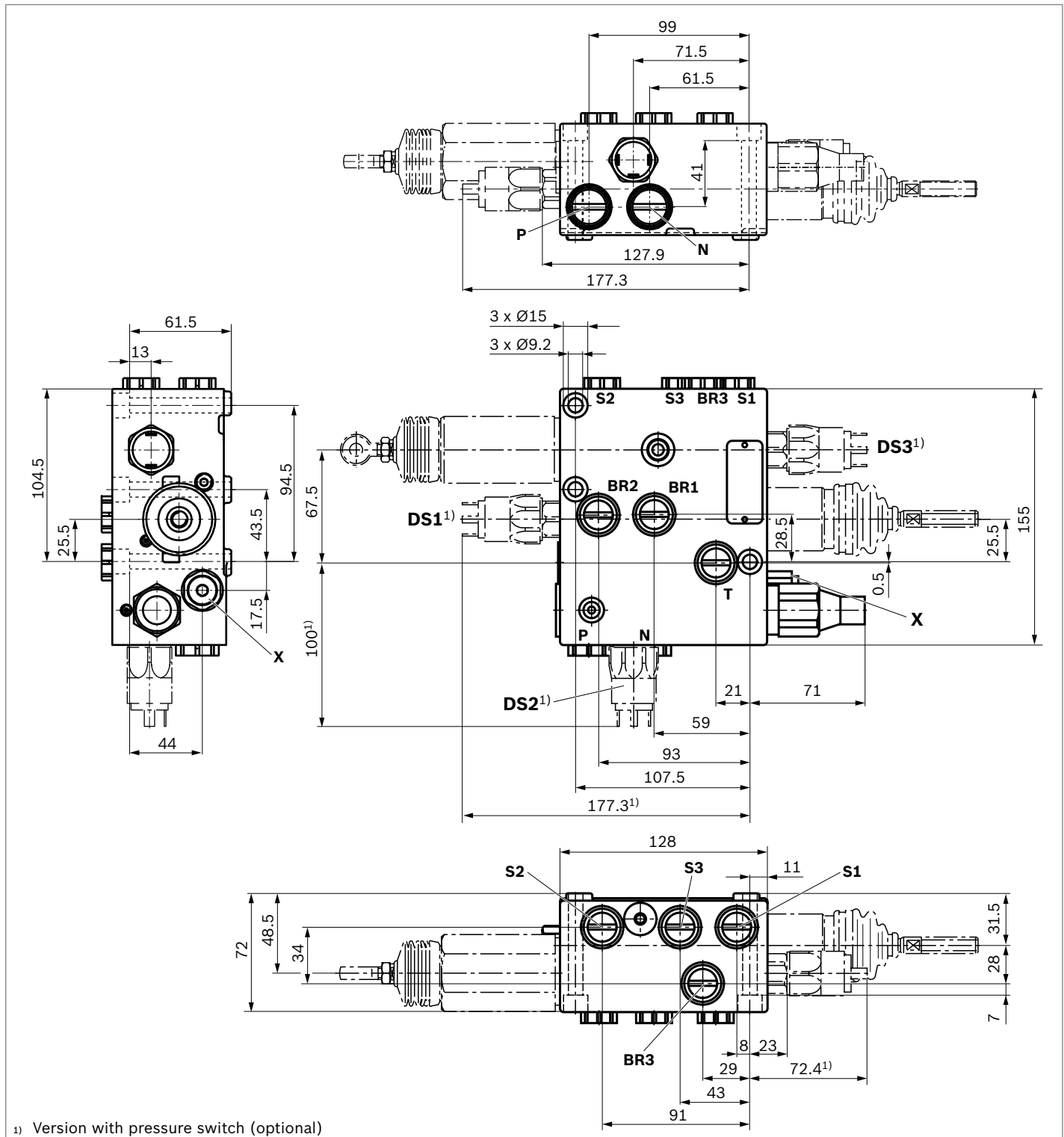
For the control, we recommend the tandem master cylinder MH17861.2.1 from FTE Automotive (Ebern/Germany). The stroke volume of the encoder cylinder and the displacement of the LT 13 H pickup head are matched to one another.

Notice

If one control line (4) fails, the tandem master cylinder requires twice the actuation path to achieve the brake pressure. Twice the actuation path cannot be achieved with the LT 20.

Dimensions

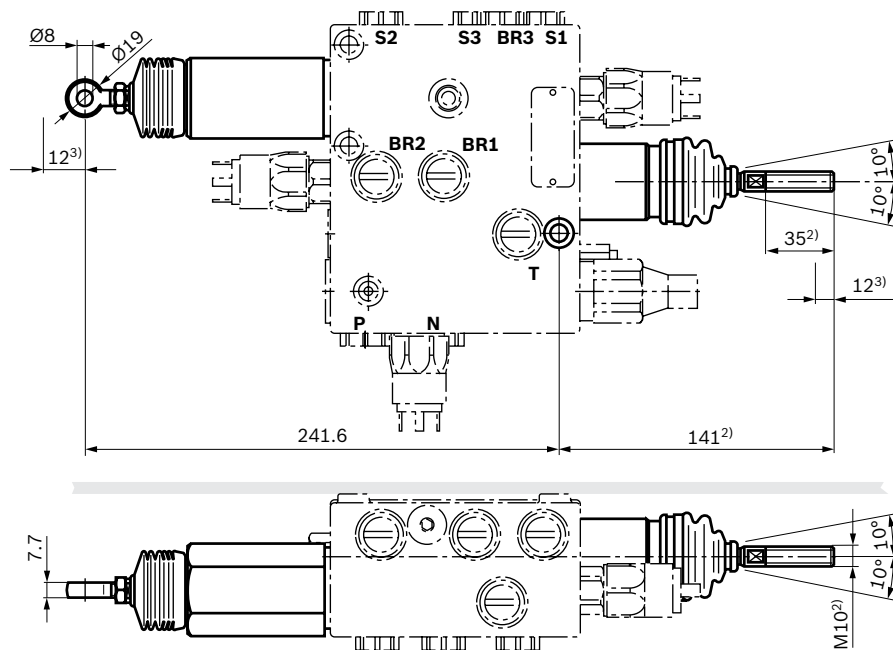
▼ Basic valve LT 13



▼ Mechanical actuation BBA, mechanical FBA

Version

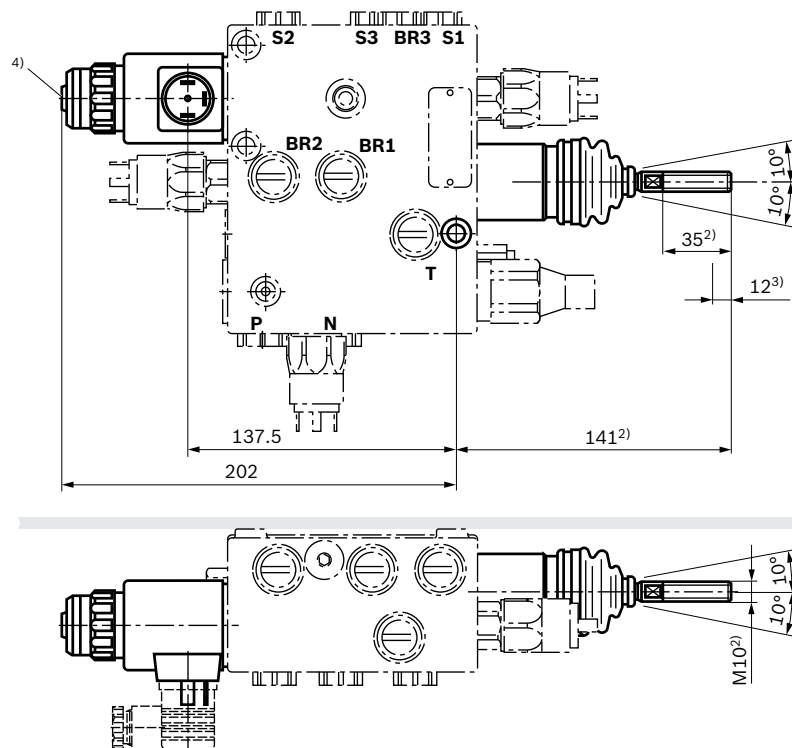
LT 13	M	3X	...	M	...
-------	---	----	-----	---	-----



▼ Mechanical actuation BBA, electric FBA

Version

LT 13	M	3X	...	E	...
LT 13	M	3X	...	S	...



2) Version with actuation lever

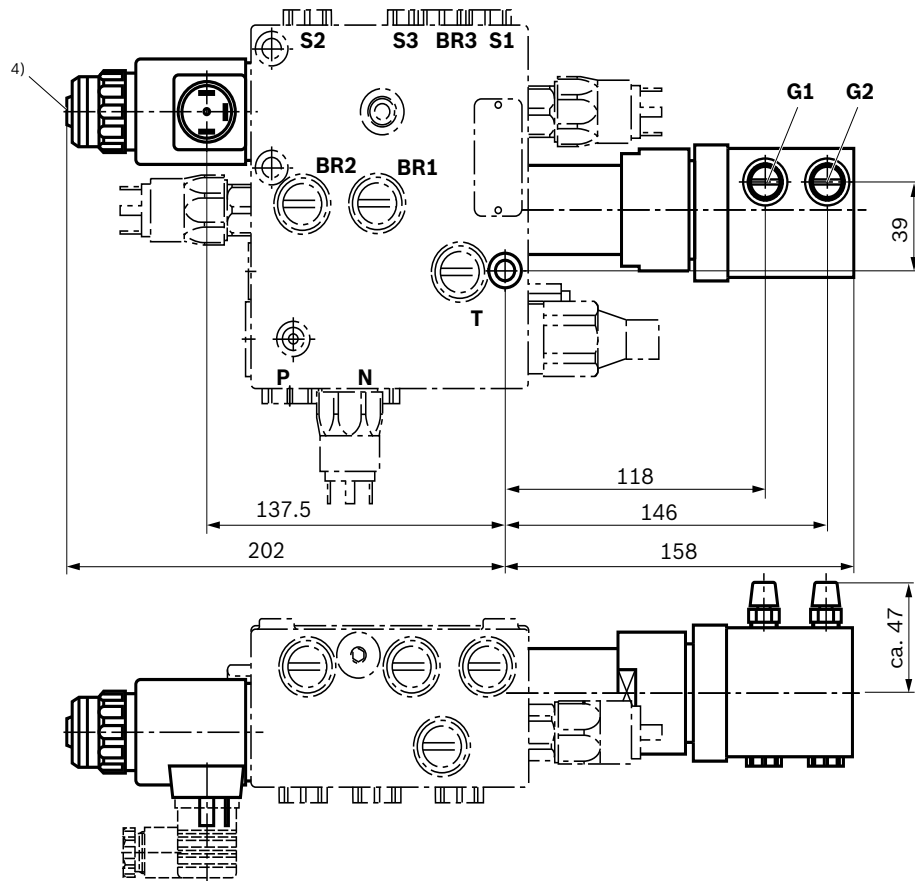
3) Maximum stroke

4) Manual override device

▼ Hydraulic actuation BBA (series connection), electric FBA

Version

LT 13	H	3X	...	E	...
LT 13	H	3X	...	S	...

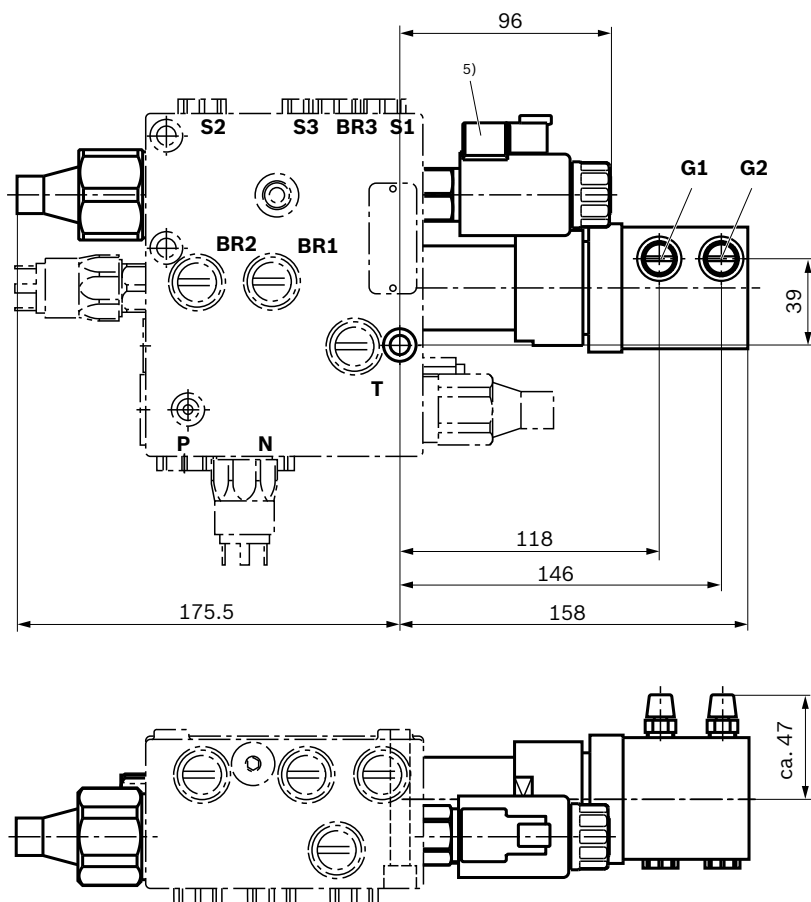


4) Manual override device

▼ Hydraulic actuation BBA (series connection), electrically reduced FBA

Version

LT 13	H	3X	...	R	...
-------	---	----	-----	---	-----

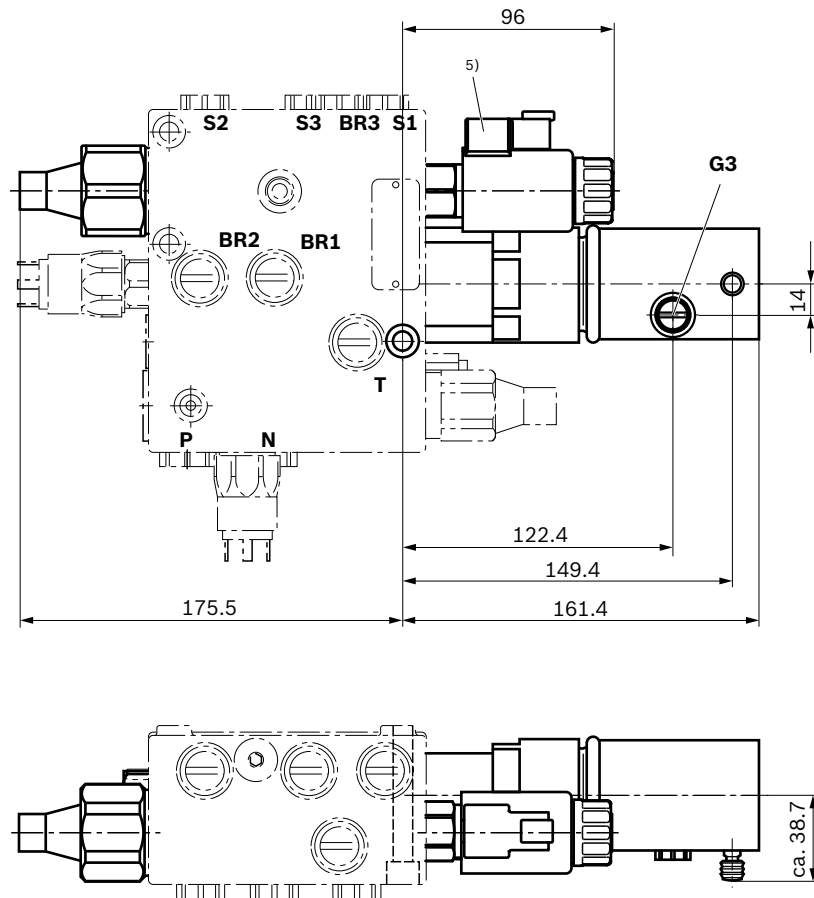


5) With connector type C4, K4 or K40, depending on the version

▼ Hydraulic actuation BBA (parallel connection), electrically reduced FBA

Version

LT 13	P	3X	...	R	...
-------	---	----	-----	---	-----

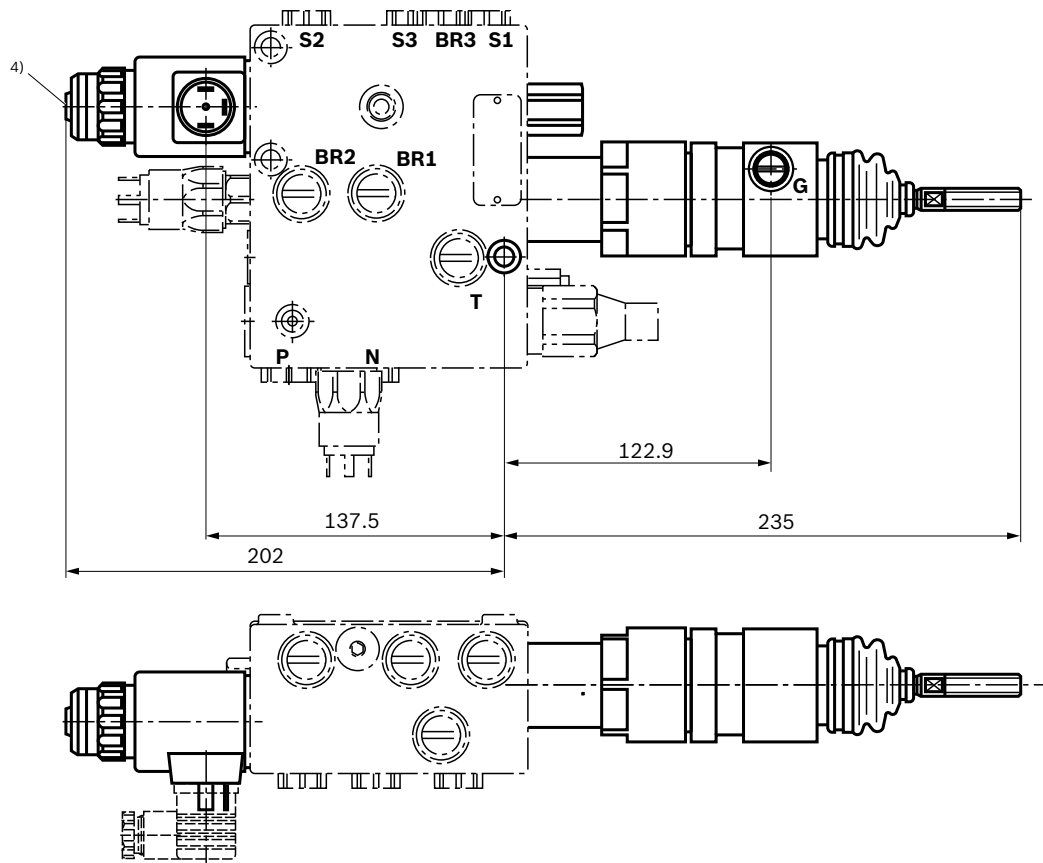


6) With connector type C4, K4 or K40, depending on the version

▼ Mechanical/hydraulic combined actuation BBA, electric FBA

Version

LT 13	K	3X	...	E	...
-------	---	----	-----	---	-----

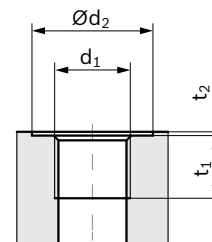


4) Manual override device

Line connections

Thread design 02

Port	d ₁	Ød ₂	t ₁	t ₂
BR1, BR2, BR3	M16 × 1.5	26	12	1
DS1, DS3	M12 × 1.5	18	12	0.5
DS2	M10 × 1	–	6	–
S1, S2, S3	M16 × 1.5	26	12	1
G, G1, G2	M12 × 1.5	20	12	1 ¹⁾
G3	M12 × 1.5	20	12	2
X	M12 × 1.5	18	12	1
P, N	M18 × 1.5	28	12	1.5
T	M16 × 1.5	26	12	1



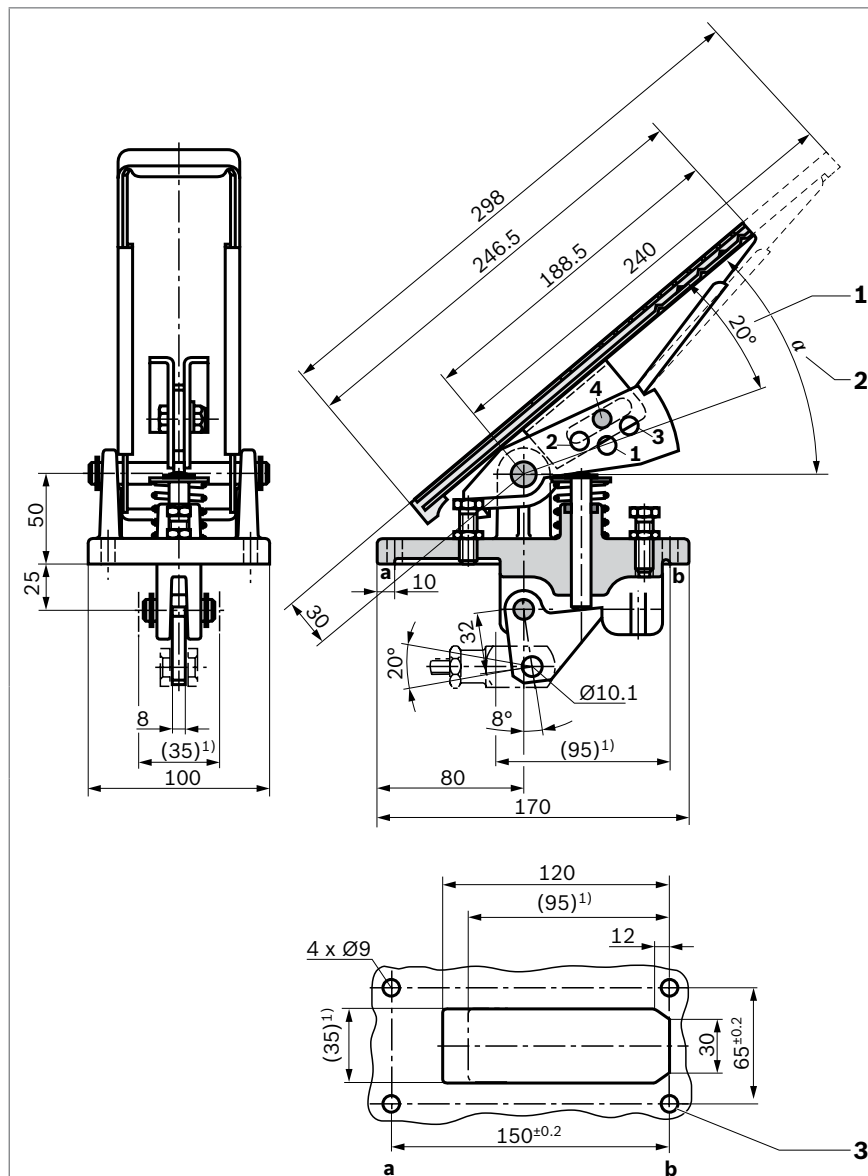
The surface is not machined at port **DS2** (no countersink).
The seal of port **DS2** must therefore be made by means of a conical thread.

For the recommended pressure switch, see page 19.

¹⁾ Version LT 13 P: **G1** = 2.5

Brake pedal models

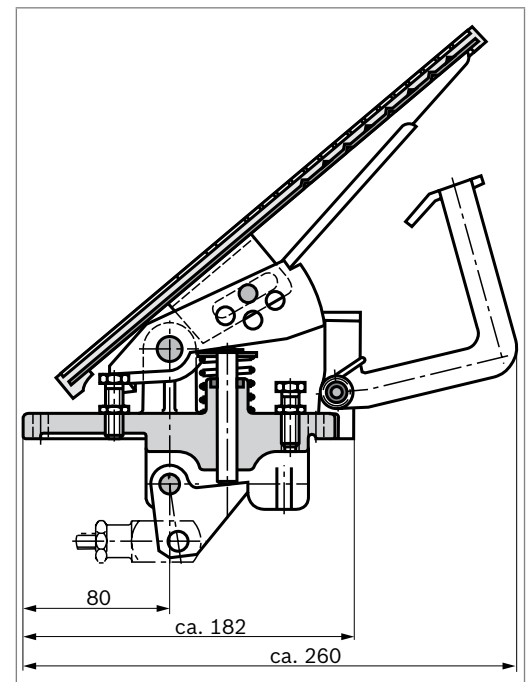
▼ Standard version LT 20 (R900412420) / special version LT 20 with shortened pedal plate (R901056192)



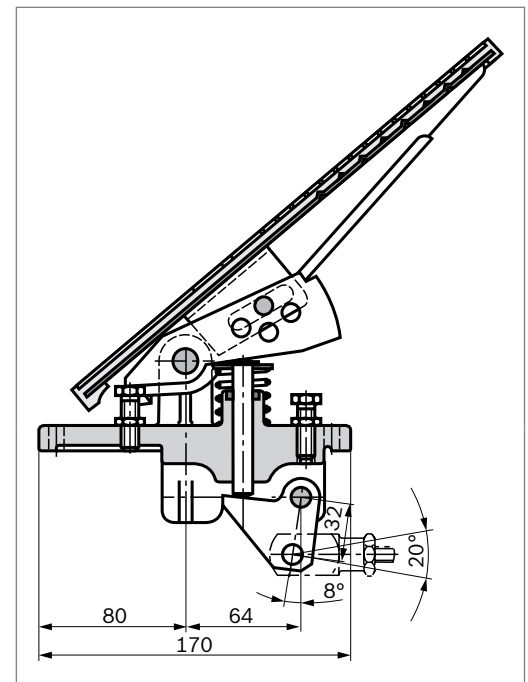
- 1 Actuation angle
- 2 Pedal work angle α can be adjusted in 5° steps:
Hole 1 = 25°
Hole 2 = 30°
Hole 3 = 35°
Hole 4 = 40° (standard version)
- 3 Suggestion for hole pattern in the base plate

¹⁾ Minimum dimensions of the base plate for installing the pedal

▼ Special version LT 20 with locking hook (R900328536)



▼ Special version LT 20 with actuation rod to the front (R900412421)



Notice

All pedal models come equipped with a slip-resistant, removable rubber mat.

Accessories

Brake pedals

Description	Order number
Standard version LT 20	R900412420
Special version LT 20 with locking hook	R900328536
Special version LT 20 with actuation rod to the front	R900412421
Special version LT 20 with shortened pedal plate	R901056192

Pressure switch

Port	Function	Switching pressure	Order number
DS1	Brake lights	5 bar	R901355130
DS2	Accumulator pressure	100 bar	R901453122
	Accumulator pressure	115 bar	R901468577
DS3	Parking brake	25 bar	R901355138

Other components (recommendation, not sold by Bosch Rexroth)

Description	Type
Stepped tandem cylinder	MH17861.2.1 from FTE Automotive, Ebern/Germany
Bowden cable (remote actuation FBA)	MFB GmbH, Mülheim a. d. Ruhr/Germany
Clevis	FBA axis connection, clevis according to DIN 71752 G8 × 16/32
	BBA axis connection, clevis according to DIN 71752 G10 × 20/40
Accumulator	Notice: Use ECO diaphragms for brake accumulators (for extended temperature range!)

Related documentation

Further information on installation, commissioning, and operation can be found in the instruction manual 66200-B: “Hydraulic power brake valves for mobile applications”.

Bosch Rexroth AG
Mobile Applications
Zum Eisengießer
97816 Lohr am Main, Germany
Phone: +49 9352 18-0
info.ma@boschrexroth.de
www.boschrexroth.com

© Bosch Rexroth AG 2017. All rights reserved, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights. The data specified within only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.